Time-course analyses of changes in End-Expiratory Lung Volume measured by Electrical Impedance Tomography

Fratti I[1], Hahn G[1], Pozzi T[1], Fioccola A[1], D'Albo R[1], Velati M[1], Nicolardi R[1], Lombardo F[1], Gattarello S[1], Busana M[1], Moerer O[1], Romitti F[1] and Gattinoni L[1]

[1] Department of Anaesthesiology, Medical University of Goettingen, University Medical Center, Robert-Koch-Strasse 40, Goettingen, Lower Saxony, Germany

Introduction

Electrical impedance tomography (EIT) is a rapid, instantaneous and continuous bedside assessment of regional pulmonary ventilation, commonly used in Intensive Care Unit. The aim of the study was to measure the end-expiratory lung volume (EELV) time-course using EIT in mechanically ventilated pigs.

Material and Methods

We performed a post-hoc analysis on 119 anesthetized female pigs ventilated in volume-controlled mode for 48 hours. Tidal volume, respiratory rate and PEEP were set to obtain different level of Mechanical Power Ratio (MPR), *i.e.* the ratio between measured mechanical power of the respiratory system and expected "ideal" mechanical power. We calculated the beta coefficients of the regression of total, ventral and dorsal EELV over time to quantify the regional EELV worsening during the experiment. To assess these trends in pigs with different ventilation, we divided them in ten deciles of MPR. For the overall comparisons we used aKruskal-Wallis test. Therefore, we compared the single groups using Wilcoxon test with *p* adjustment for multiple comparisons.

Results

We noticed an overall worsening of total, ventral and dorsal EELV according to the increase of MPR within the experiment ($p < 0.001$). When performing the comparisons amongst consecutive MPR quantiles, we noticed significant differences ($p < 0.05$) between the third-fourth and fourth-fifth decile in ventral region and in whole lungs. When considering the dorsal region, the first significance was between the forth-fifth decile of MPR [Figure 1].

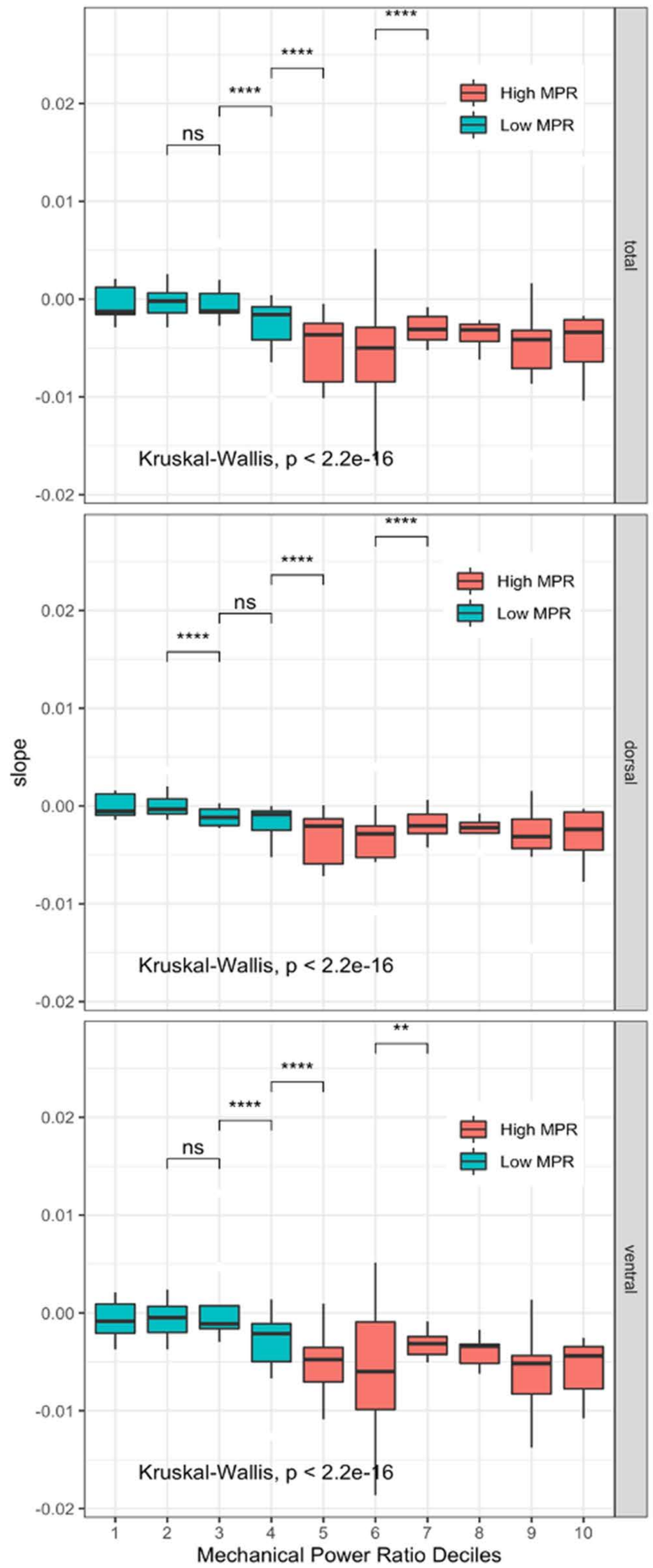

Figure 1: Time-course analyses of changes in EELV compared with MPR deciles. The differences between the groups were analyzed using a Wilcoxon test. (A) Total lung; (B) Dorsal region; (C) Ventral region.

Conclusions

To our knowledge, this study is the longest analysis of EELV trend in time (48 hour). The increase of MPR above 2.76-5.46 resulted in a significant difference in worsening of lung volumes measured by EIT. In the future, MPR could represent an important and easy-to-measure variable to tailor mechanical ventilation.

34 smart
Smart Meeting Anesthesia Resuscitation inTensive care

UNIVERSITÄTSMEDIZIN GÖTTINGEN : UMG